

REMARKS

The Examiner objected to claim 1. Claim 1 is formatted into a method form without changing the scope of the claim. Consideration of this amendment despite finality is requested.

Claims 1, 22, and 23 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Hunt (US 2003/139664) alone or in view of Erikson (US 6,752,763). Claims 2, 4, 6, 9, 10, 12, 14-17, 19, 20 and 24 were rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Hunt or Hunt in view of Erikson in further view of Leavitt (US 6,491,634). Claim 3 was rejected pursuant to 35 U.S.C. §103(a) as unpatentable over either Hunt or Hunt in view of Erikson in view of Leavitt and further in view of Chiang (US 5,839,442). Claim 5 and 22 was rejected pursuant to 35 U.S.C. §103(a) as unpatentable over Hunt or Hunt in view of Erikson in further view of Peterson (US 2004/0181154). Claims 11 and 18 were rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Hunt or Hunt in view of Erikson, in view of Leavitt and further in view of Peterson.

Applicant respectfully requests reconsideration of the rejections of claims 1-6, 9-12, 14-17, and 19-24, including independent claims 1, 9, 16 and 22.

Independent claim 1 recites converting in a connector housing releasable from the ultrasound system, a cable connecting the transducer probe housing with the connector housing.

The Examiner believes it would have been obvious, based on Hunt, to have three housings in Hunt, one for the transducer, another for additional circuitry, and a last for the ultrasound processor. The Examiner further asserts that a cord would be obvious between each of these housings and would be releasable.

Claim 1 has been amended to provide the context of a traditional cart-based imaging system where the imaging system is connectable with different transducer assemblies. The recited method is for a transducer assembly of a cart-based system, where different transducer assemblies can be connected at different times to the system for different examinations. In particular, claim 1 recites that the transducer connector is releasably connectable with the ultrasound system, the ultrasound system comprising a transmit beamformer, a receive beamformer, and a system connector in a system housing, the system housing comprising a cart-based housing resting on wheels, the system connector permanently connected through a transmit and receive switch to the transmit and receive beamformers. Hunt is directed to hand

held systems with hand held housings for all housings (title; abstract; and Figs. 1-4 and 6-7). A transducer assembly for connection with a cart-based housing resting on wheels is not provided.

Claim 1 recites that the converting in the connector housing makes signals, from the elements, in the connector housing compatible with the receive beamformer of the cart-based system. Hunt provides a processing path that may include multiplexing or portions of receive beamforming. However, the conversions of data from the elements would not be performed in the connector housing of a transducer assembly connectable with a cart-based system. Hunt is designed for operation in a handheld system (see paragraphs 3-6), with housing separation for the handheld system. Any teaching of circuitry separation and placement in housings is due to the handheld nature of the entire system of Hunt. The transducer and circuitry separation taught by Hunt are not applicable to the cart-based system.

Hunt provides a system with components designed to operate together. Similarly, Erikson provide a transducer assembly outputting data from the probe interface (connector housing) with the data in the standard format as provided by the probe 320. Neither reference discloses converting, in the connector housing of a transducer assembly for use with a cart-based system, the signals to be compatible with the receive beamformer of the cart-based system. Erikson does not need such conversion as the transducer outputs signals to be used by the workstation. Hunt teaches away from cart-based systems (see paragraph 3), so any conversion by Hunt would not be used in a transducer assembly of a cart-based system.

A person of ordinary skill in the art would not have provided the limitations of claim 1 even before amendment. The Examiner cites to the corded connection between the ultrasound device 12 and the display device 14, alleging releasable connection as obvious. However, given this construction, the conversion would not occur in the connector housing releasable from the ultrasound system (display 14 as cited to by the Examiner). The Examiner cites to the ADC 36 for conversion, noting this circuit is in the housing 16. The housing 16 is part of the device 12 (see Fig. 1), not the display 14. There is no suggestion to provide the ADC in any connector housing of the cord cited to in paragraph 61. In other words, the Examiner cites to the housing 16 as the releasable connector, but cites to a cord from the system 12 in the housing 16 from paragraph 61 to the display 14. Any releasable connector housing separated by this cord cannot be the housing 16, but would be by the display 14. The ADC would not be positioned in a

connector housing for releasable connection with the display 14 on the other end of the cord from the housing 16, but would be at the other end of the cord and where taught - in the housing 16.

The housing 16 may be divided into two probe housings separated by a cord (paragraph 28). Neither is a connector housing. Paragraph 61 then uses another cord to connect to the display 14. This is the allegedly releasable connection to the system. However, there is no conversion circuit such a releasable connector to the display 14.

In response, the Examiner cites to paragraph 28 to show the transducer 18 and additional circuitry in a housing separate from the processor 38, then cites to paragraph 22 to show the transducer 18 separate from the housing 16, and alleges that this results in three housings, one for the transducer, one for the additional circuitry, and one for the processor. However, this reading is incorrect. The combination of paragraphs 22 and 28 does not provide for three housings. Paragraph 22 separates the transducer from the housing 16, but is silent about the additional circuitry being separated. Paragraph 28 separates the transducer and additional circuitry from the housing 16. Both together provide for the transducer and circuitry separate from the housing 16, not from each other in three housings. Thus, the reading of paragraphs 22 and 28 provides two housing, one with transducer and additional circuitry and the other with the processor. Paragraphs 22 and 28 together do not provide the three housings relied on by the Examiner. Hunt, et al. do not disclose conversion in a releasable housing spaced from the transducer by a cord.

The embodiments of Fig. 6 described in paragraphs 42 and 43 provide multiple housings, but only one cord (see Fig. 6). The housing for the transducer is joined to the housing for the user input without a cord as shown in Fig. 6. Without this cord, a cord does not separate the transducer from the conversion circuit. A cord 42 does separate the display and processor 38 (Fig. 6), but this cord 42 does not separate the transducer from the additional circuitry.

Figure 7 provides a cord between the housings 16, 40, but not with the processor 38. If this cord is releasable, the release is between or with one of the housings. This results in a lack of a connector housing with the conversion circuitry.

Erikson does not solve this problem. Erikson teach a releasable connector housing 324, but do not teach conversion in the housing 324. Erikson is cited by the Examiner merely for

teaching releasable connection. As noted above, Hunt, even if providing such releasable connection at the end of the cord for connecting to the display 14, do not provide for conversion in such the releasable connector housing.

The Examiner uses obviousness in multiple layers – obvious to have three housings, obvious to use cords instead of wireless, and obvious to use releasable connection wherever. Hunt provide a handheld system with specific goals for an entire system to be handheld. The Examiner proposes multiple redesigns of this system. The Examiner is relying on hindsight reasoning.

Independent claim 9 recites a transducer assembly comprising a connector housing at least partially enclosing a detachable connector and enclosing a signal processing device where the connector housing connects to the transducer by a cable external to the connector housing between the connector housing and the transducer.

Claim 9 is allowable for similar reasons as claim 1. Even if the cited cable (paragraph 61) of Hunt has a releasable connector, the electronics for beamformation are in the housing 16 on the other end of the cable from any releasable connector at the display 14. Even given separation of components into multiple housings, there is no teaching that a releasable connector with the display device including any beamformation.

The Examiner relies on the partial beamformer teaching of Hunt where part is done in the probe housing and the remaining beamforming is done in the connector housing. However, this “connector housing” of Hunt is part of the system rather than a simple connector housing of a transducer assembly. A transducer assembly has a known meaning in the art other than mere arbitrary division of components. To clarify this distinction, claim 9 has been amended to recite that the transducer assembly is configured for connection with the ultrasound system comprising a cart-based system, the connection being standardized for the cart-based system such that different transducer assemblies, including the transducer assembly, are connectable with the cart-based system for different examinations, the output signals of the transducer including signals in a plurality of channels for receive beamformation by the cart-based system. Hunt provide handheld components for a handheld system, not a transducer assembly for use with a cart-based system. Erikson is cited for a releasable connector, not the transducer assembly and ultrasound

system. The handheld teachings of Hunt would not have been used in the cart-based system of Erikson (see paragraph 3 of Hunt) and the placement of the signal processing device in the connector housing of a transducer assembly of a cart-based system is not suggested in Erikson.

Independent claim 16 is allowable for the same reasons as claims 1 and 9.

Independent claim 22 is allowable for similar reasons as claims 1 and 9.

Dependent claims 2-6, 10-12, 14-15, 17, 19-21, and 23-24 depend from one of the independent claims, so are allowable for the same reasons as the respective base claim. Further limitations patentably distinguish from the cited references.

Claim 4 recites partial beamformation of demuxed signals. Hunt teaches multiplexing, but does not suggest partial beamformation of demultiplexed signals.

Claim 6 recites that the converting is mixing. Summing is not mixing. Mixing is a term of art for multiplying two signals, not summing. Summing signals is not mixing the signals. Claim 12 is allowable for similar reasons.

Claim 17 recites sub-array mixing. In Leavitt, the multiplier 690 is for normalization of filter gain for a delayed sample (col. 10, lines 2-31), not sub-array mixing. The Examiner relies on summing to show sub-array mixing. Mixing is a term of art not encompassing summing.

CONCLUSION:

Applicant respectfully submits that all of the pending claims are in condition for allowance and seeks early allowance thereof.

PLEASE MAIL CORRESPONDENCE TO:

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